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**Office of Biopower and
Hydropower Technologies**



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www.eren.doe.gov



Bioenergy and Biobased Products Initiative: Growing an Integrated Industry

- **Biorefinery**—"We are looking forward to a day when a ton of biomass will be traded like a barrel of imported oil is today."
—Assistant Secretary of Energy Dan W. Reicher
- **Bipartisan effort**—Executive Order 13134, and bills introduced by Sen. Lugar, Rep. Udall and Rep. Ewing calling for integration and R&D.
- **Goal to triple the current use of biomass by 2010**, expanding the possibilities for sustainable energy use in power production, transportation, and biobased products.
- **Promises major benefits for energy security, the environment and farm economy.**

Biomass: The Basic Resource



Chemical
Products



Fuels



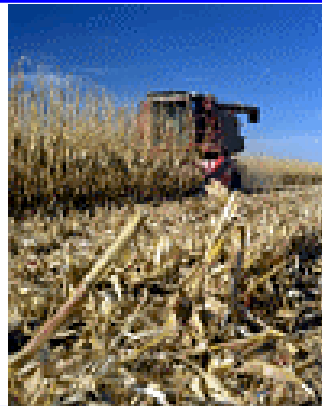
Electric
Power

Biomass Feedstocks



Wood Residues

Sawdust
Wood chips
Wood waste
pallets
crate discards
wood yard trimmings



Agricultural Residues

Corn stover
Rice hulls
Sugarcane bagasse
Animal waste



Energy Crops

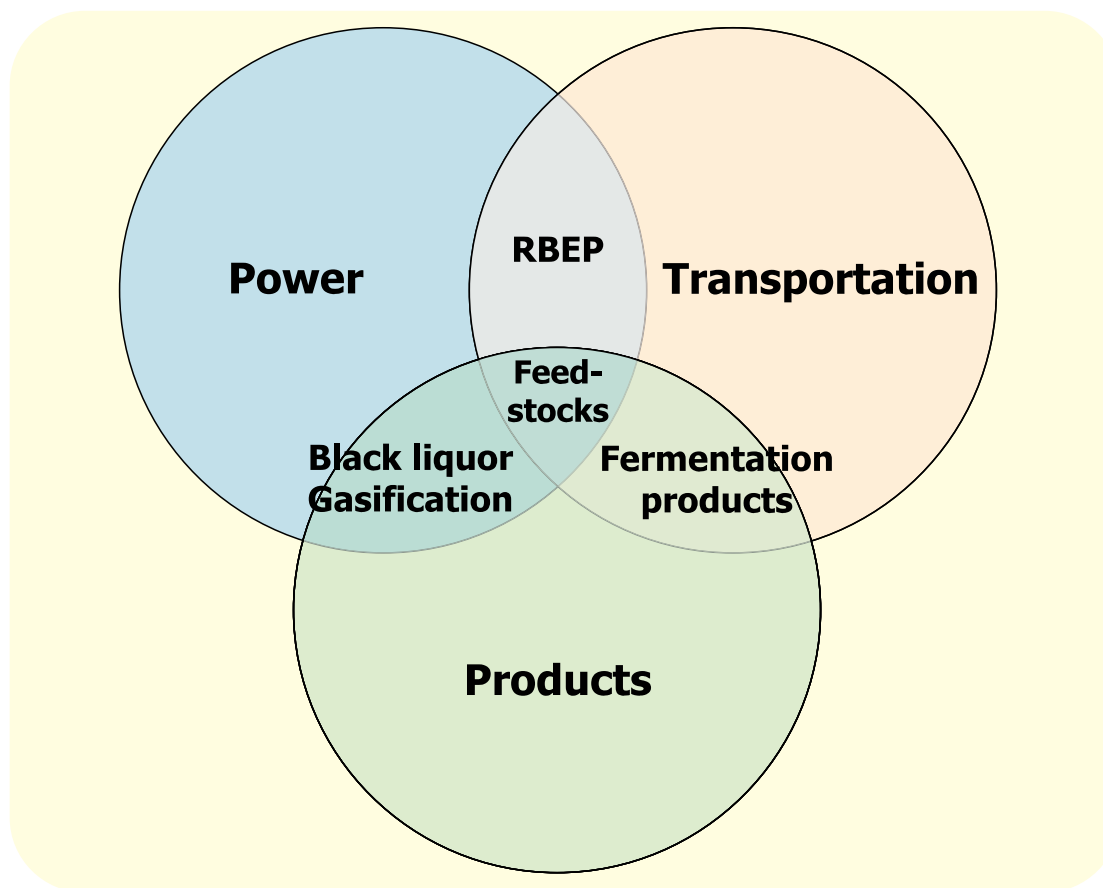
Hybrid poplar
Switchgrass
Willow

Program Benefits

- Revitalize rural economies
- Remove biomass residues from the waste stream
- Improve the environment through reduction in greenhouse gas emissions



Bioenergy Initiative: Departmental Collaboration



FY 2001 Program Snapshot: Bioenergy Initiative

	FY2000 Enacted	FY2001 Request	Initiative
Program Total	\$110.9M	\$175.7M	\$30M
• Office of Power Technology	31.5	48.0	11
• Office of Transportation Technology	38.9	54.4	7
• Office of Industrial Technology	11.0	43.8	12
• Office of Science	29.5	29.5	—



Biopower Mission

The mission of the Biopower program is to integrate sustainable biomass feedstock production with efficient biomass power generation systems that can provide substantial energy, economic, and environmental benefits.



BioPower Technologies

Co-Firing

- With Coal or Natural Gas (up to 15%)
- 330 GW of Coal Fired in U.S.

Small, Modular Systems

- Microturbines, Reciprocating Engines, Stirling Engines, Fuel Cells
- Distributed Energy Resources (off-grid)
- Village Power

Gasification

- Natural Gas Turbine
- Byproducts/ Chemicals (Bio-refinery)

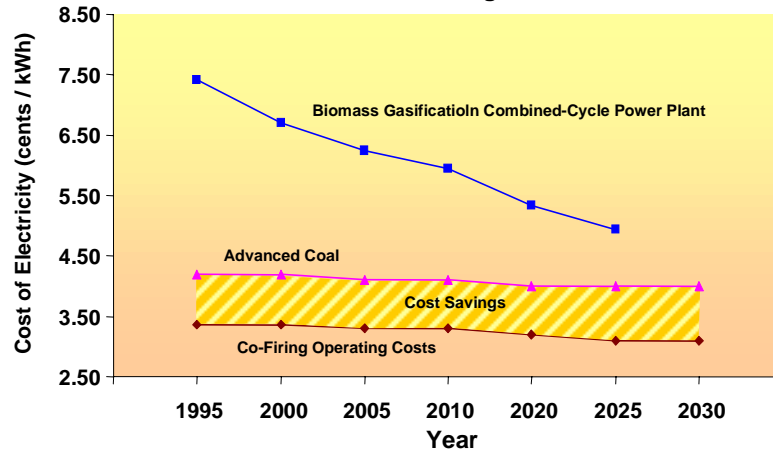
BioPower Technology Enablers

- Thermochemical Conversion
- Feedstock Development
- Regional Biomass Energy Program
- Bioenergy Initiative

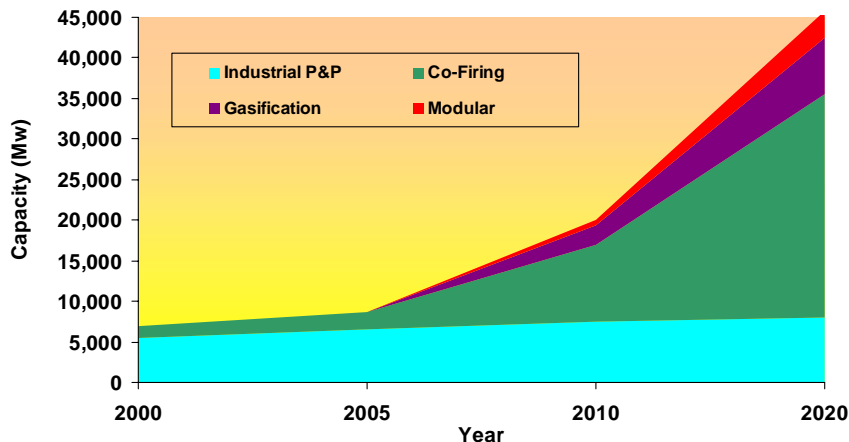


Biopower Technologies

Cost of Electricity: Biomass Gasification and Co-Firing



Biopower Capacity Projection, 2000-2020



Other Benefits

- Farm Income
- Jobs
- Landfill Diversion
- CO₂ Capture
- 10-Million Acres of Energy Crops (2020)

FY 2001 Program Snapshot: Biopower Systems

	FY2000 Enacted	FY2001 Request	Change
Program Total	\$31.8M	\$48.0M	+ \$16.2M
• Thermochemical Conversion	1.7	5.0	+ 3.3
• Systems development	23.0	26.4	+ 3.4
• Feedstock development	3.1	4.0	+ 0.9
• Regional biomass energy program	1.0	1.6	+ 0.6
• Bioenergy Initiative	3.0	11.0	+ 8.0

FY 2001 Highlights

- **Begin second round of solicitation of Bioenergy Initiative**
- **Carbon Savings Initiative**
- **Rural Development Projects in NY and IA**
- **Complete two additional co-firing projects to the point of commercial readiness**
- **Begin Agricultural Residues to Energy Initiative**
- **Successfully demonstrate sustained operation of Vermont Gasification system and begin Phase III**



Hydropower Program

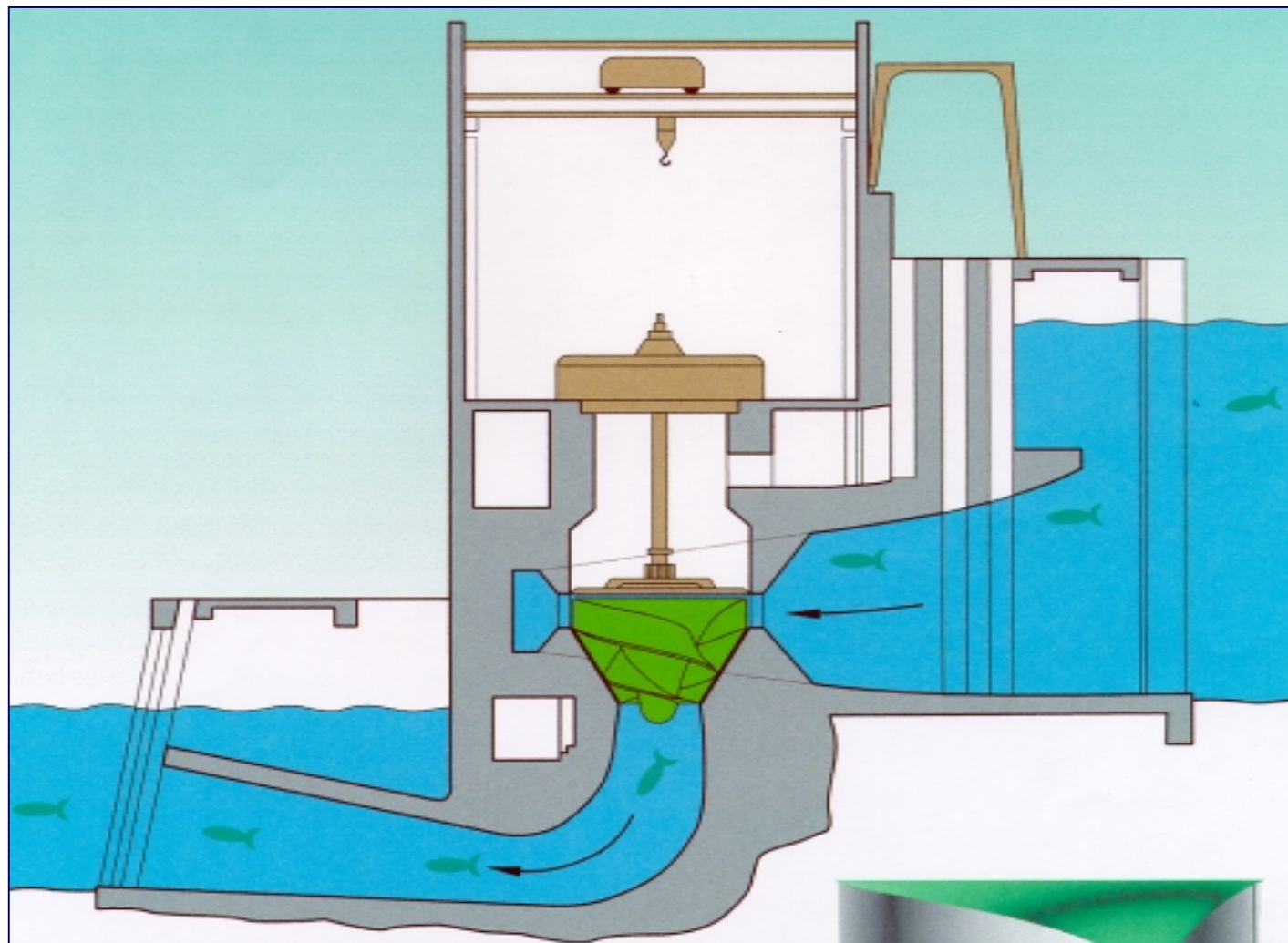
Advanced Turbine Research and Development Goal

- The development of advanced hydropower turbine technology with improved environmental performance to support the CNES goal to “maintain the viability of existing hydropower sources.”
 - Reduce turbine-induced fish mortality to 2% or less



Hydropower Program Elements

- Advanced Turbine R&D (primary program thrust)
 - Initial conceptual designs
 - Biological design criteria
 - Proof-of-concept testing
 - Prototype testing of promising advanced turbine concepts



**ARL/NREC
Fish Friendly
Turbine**



Microsensor Surrogate Fish

■ Incorporates sensors for measuring:

- Acceleration
- Strain
- Pressure
- Orientation

